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Industrial Self-Government

A leading article in a recent issue of " The Times " forecasts, based no doubt on the Government White Paper on Employment, an inquiry into the activities of trade associations. Emphasis is laid on the need for " a more precise legal definition of their functions, for their registration and supervision by some public authority, and for a fuller measure of publicity in their proceedings." We are reasonably well assured that so far as the foundry industry is concerned, such an investigation, together with appropriate legislation, would be welcomed. At the moment employers' associations are often in a quandary as to whether they should exist as a limited liability company without capital, a friendly society or a trades union. The attitude of the public towards them, it is suggested by " The Times," results from an observation by Adam Smith that " people in the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public or in some contrivance to raise prices." We suggest that the more modern outlook is " I don't give a hang what I pay for an article so long as I am assured that nobody is buying more cheaply."

Thus there is honest justification for the establishment of a price-list, when this results from free negotiation between the trade associations of the buyers and the sellers. Both parties are aware that if the price-list is established at too high a level, it presents a golden opportunity for the foreigner, a competing industry, and perhaps an actual member to benefit thereby. The depositing of such a price-list with the Board of Trade or other authority should be the hall mark of its all round fairness. Whether this will be an outcome of future legislation is obviously problematic, but it is reasonable to believe that inasmuch as the Government departments have consistently and to an increasing extent dealt with the employers' associations during the war, they cannot help but recognise that media for industrial self-government must be granted a proper standing in the post-war era. It is perhaps a little unfortunate that organisations of employers undertaking negotiations with the trades unions for the establishment of working conditions, are classed with those which specifically exclude these activities, because of the misconceptions which arise. The latter have much in common with the trades unions, and have during the war found themselves on the same delegation to a ministry. Extra clothing coupons for foundry workers is a typical instance.

If the trades unions really become alive to the fact that pay packets are not everything in this wide world—and this is gradually dawning on some of the more enlightened leaders—then there would be a sound case for the establishment of joint committees to work for the general good of the industry. The Melchett-Turner conversations were directed towards this end, but these were on too wide a basis to be practical. It would be helpful to union officials to learn something of the difficulties of establishing conditions of sale for an industry, or of the concentration of an industry in an area; how the present income tax allowances for the obsolescence of machinery adversely influences industrial progress, or how a proposed alteration in a railway rate affects their livelihood. When employers' associations are officially recognised and registered, then those which are prominent at that time will have the best opportunity for influencing legislation for the better conduct of industry.

Mr. R. S. Archer, the well known American metallurgist, has joined the Climax Molybdenum Company as metallurgical assistant to the managing director.

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MEEHANITE RESEARCH INSTITUTE

ANNUAL MEETING AT YORK

The twelfth annual meeting of the Meehanite Research Institute was held in York on June 22 and 23, when, in the continued enforced absence of Mr. Oliver Smalley, O.B.E., the vice-chairman, Mr. N. E. Rambush, presided. He was supported by Mr. John Cameron, J.P., and Mr. E. M. Currie, directors, and the staff of the International Meehanite Metal Company, Limited.

There was a record attendance.

The chairman, in opening the meeting, extended to all a cordial welcome to take a share in the work of the Institute, and hoped that they would find the sessions both interesting and useful. He then read a communication from Mr. O. Smalley, in which he expressed his regret at being prevented from being present, and congratulated the Institute upon the work accomplished during the past year, carried out in the traditional British spirit working under difficult conditions. The meeting agreed to cable a suitable reply to Mr. Smalley's letter.

The reports of the treasurer, secretary and chairman of the research committee were presented and adopted. The reports showed that the Institute was in a very satisfactory position financially, and that there had been a considerable amount of research work completed, or in progress. The members decided to treble the annual subscription to the research fund in order to permit of still more research work being undertaken.

The election of officers resulted as follows:—Directors: Mr. W. Boyd, Mr. J. Cameron, Mr. J. D. Carmichael, Mr. E. M. Currie, Mr. H. Gardner, Mr. W. H. Harper, Mr. J. Hay, Mr. N. E. Rambush, Mr. O. Smalley, and Mr. R. B. Templeton; secretary and treasurer: Mr. R. B. Templeton; chairmen of committees: Research, Mr. J. E. O. Little; Merchandising, Mr. N. E. Rambush; and Publications, Mr. W. H. Harper.

Technical Papers and Reports

The meeting considered and discussed some 30 Technical Papers, and reports dealing with a variety of subjects of particular interest to licensees and of general foundry technique.

Prominent among these were Papers dealing with details of the manufacture and service records of castings produced by licensees in Britain, U.S.A., Canada, Australia, New Zealand, South Africa and India. The Radiographic Inspection of Castings; Comparative Cost of Meehanite Castings with Welded Structure in Diesel Engine Design; the Galling, Seizing and Scuffing of Metal Surfaces; the Basic Surface Stress and Bending Stress Factors of Meehanite Gears; Standardisation of Tensile Testing Practice and the Physical Properties of Test-bars as Influenced by Method of Casting; the Production of Pearlitic Malleable; Effect of Forging Meehanite on the Physical Properties; Method of Wear Testing; the Influence of Coke Size in Cupola Practice; Measurement of the Fluidity of Molten Cast Iron; Impact Strength of Meehanite; the Practical Application of Statistical Control; the Training of the Foundry Personnel. The discussion on training apprentices led to the decision to set up an Educational and Training Sub-Committee, with Mr. W. H. Richards as chairman.

The outstanding Paper was that entitled, "A Practical Investigation Concerning the Process of Melting Iron in the Foundry Cupola," which depicted the descent of the materials from charging sill to melting zone. It showed the position and shape of each piece of metal, together with the degree of carburisation of the pieces of steel between the top of the cupola shaft to the tuyere level during melting. Naturally this report aroused considerable interest and discussion. Meetings of the board of directors and of the several committees and sub-committees were held during the period of the conference. A considerable amount of interest was taken in an exhibition of quality control charts on view during the conference.

EFFECT OF GRAIN SHAPE ON MOULDING PROPERTIES OF SYNTHETIC MOULDING SANDS

Mr. W. Davies and Dr. W. J. Rees, in Paper No. 8/1944 of the Steel Castings Research Committee of the Iron and Steel Institute (submitted by the Moulding Materials Sub-Committee), have drawn the following conclusions:—The use of sands composed of angular grains in place of sands composed of rounded grains has several disadvantages. For sands having comparable mechanical gradings it is found that:—(1) In clay-bonded mixes, the green and dry strengths for the angular sands are considerably lower than those for the rounded sands; (2) in oil-bonded mixes, the tensile strengths for the angular sands are much lower than those for the rounded sands; (3) in mixes bonded with both clay and oil, the green and tensile strengths are much lower for the angular sands than for the rounded sands; (4) when the mixes are made into long cylindrical cores by squeezing, the angular sands do not pack so uniformly as the rounded sands, that is, the bulk-density gradient is greater for the angular than for the rounded sands; and (5) test-pieces of angular sands do not strip so easily as those of rounded sands. Their surface friability after baking increases as the angularity of the grains increases.

Thus the angular sands have moulding properties inferior to those of the rounded sands, which is due partly to their greater bulk-density gradients and partly to the difference in grain relationships. The differences in strength are due primarily to grain shape and not to specific surface. If bond is added to two similarly graded sands in proportion to their specific surfaces the more angular sand will still have a much lower strength than the more rounded sand.

The effect of grain shape may be minimised in several ways. The strength properties of the angular sands can be improved if their grading is widened. The bulk-density gradient can be reduced by a suitable choice of bond. Finally, an alteration in the type and proportion of bond may improve both the strength properties and the bulk-density gradient.

RELATIONSHIP OF BRINELL HARDNESS AND YIELD STRESS IN CERTAIN CAST STEELS*

Brinell hardness test and yield stress as an acceptance test for steel castings

By T. W. RUFFLE

The increasing importance of the yield stress as an acceptance test for steel castings has made it necessary to know if this can be accurately checked by a non-destructive method, such as the Brinell hardness test, and it is thought that the following information may be of interest to the practical foundryman. The question assumed considerable importance in connection with certain highly stressed castings of approximately 100 lbs. weight, of which large numbers were required. It was desired to test each casting, and the Brinell method was suggested. The following data show that care must be exercised in interpreting the results.

The data have all been collected from test-pieces and castings in routine production, heat-treated in the normal way of output. The steel was of the 0.25 per cent. carbon, 1.5 per cent. manganese type made in the basic electric furnace. The test-pieces were all of the clover-leaf[1] pattern, and were slit down their axial length with the oxy-acetylene torch before heat-treatment (Fig. 1). All the test-pieces and castings were given a uniform normalising heat-treatment in bogie bottom furnaces fired with pulverised coal. This treatment consisted of 4 hrs.' soak at 920 deg. C., followed by air cooling on the bogie. The minimum properties required in the casting were 26 tons per sq. in. yield point, 40 tons per sq. in. ultimate stress, and 20 per cent. elongation.

After the test-bars had been pulled, Brinell readings were taken on a flat ground on the end remote from the head. All Brinell impressions dealt with in this Paper were made with a 3,000 kg. load and a 10 mm. ball applied for 15 sec. The castings were all Brinelled in the same position after preparation of the surface with a small hand-grinding wheel. Readings could be made on the test-bars to 0.05 mm. and to 0.10 mm. on the castings. Three Brinell machines were used in the course of the investigation, but all were checked occasionally with a standard hardness block and found to be accurate.

TABLE I.—*Tensile Strength Related to Brinell Hardness from Published Sources.*

Dia. in mms.	Brinell hardness number.			Conversion factor.			Equivalent tensile strength.		
	A	B	C	A	B	C	A	B	C
3.0	415	415	418	0.2190	0.2210	0.2180	91.0	92.0	91.0
3.5	302	302	302	0.2150	0.2180	0.2180	65.0	66.0	66.0
3.8	255	255	255	0.2195	0.2195	0.2155	56.0	56.0	55.0
4.0	229	229	228	0.2185	0.2185	0.2190	50.0	50.0	50.0
4.2	207	207	207	0.2170	0.2170	0.2170	45.0	45.0	45.0
4.3	197	197	196	0.2205	0.2180	0.2195	43.5	43.0	43.0
4.4	187	187	187	0.2245	0.2195	0.2195	42.0	41.0	41.0
4.5	179	179	179	0.2235	0.2180	0.2205	40.0	39.0	39.5
4.6	170	170	170	0.2235	0.2180	0.2260	38.0	37.0	38.5
4.7	163	163	163	0.2240	0.2150	0.2300	36.5	35.0	37.5
4.8	156	156	156	0.2245	0.2180	0.2310	35.0	34.0	36.0
5.0	143	143	143	0.2240	0.2240	0.2305	32.0	32.0	33.0
5.4	121	121	121	0.2315	0.2315	0.2315	28.0	28.0	28.0

A general relationship between B.H.N. and U.S. is widely recognised and used by engineers and metallurgists. It was therefore decided to examine this relationship as an opening to the present enquiry, and the following points were investigated in detail:—(1) The B.H.N. and U.S. of separately cast test-pieces; (2) the yield ratio of the test-pieces; (3) the B.H.N. and yield stress of the test-pieces, and (4) the agreement in B.H.N. between test-pieces and castings.

The factor relating the Brinell hardness and ultimate stress is estimated empirically, and is derived by dividing the ultimate stress by the hardness number, i.e.,

$$\frac{\text{U.S. (in tons per sq. in.)}}{\text{B.H.N.}} = \text{Factor}$$

* Paper read at the Forty-first Annual Meeting of the Institute of British Foundrymen. The Author is Metallurgist, Lake & Elliot, Limited.

Yield Stress in Certain Cast Steels

Greaves and Jones[2] after statistical investigation of a considerable amount of data gave the following values for this factor:—

Heat-treated alloy steel B.H.N. 250–400	0.210
„ „ and carbon steel B.H.N. less than 250	0.215
Medium carbon steel as rolled, annealed or normalised	0.220
Mild steel as rolled, annealed or normalised ..	0.230

These factors are necessarily approximate, more precise figures can only be established by considering appropriate point. A general summation of all the results gives an average conversion factor of 0.2226, *i.e.*,

$$U.S. = B.H.N. \times 0.2226.$$

Table II compares the average factor found by experiment with the average factor for the same section of the Brinell table in use. The difference is very small. The maximum and minimum factors are also compared in Table I, and it will be seen that more extreme results are derived from the experimental data. From an examination of Fig. 2, it is evident that there is a considerable variation in ultimate stress at any given B.H.N. Errors can arise from a number of factors affecting the accuracy of the ultimate stress figure, the accuracy of the Brinelling operation and reading and from variation from point to point in the material under test.

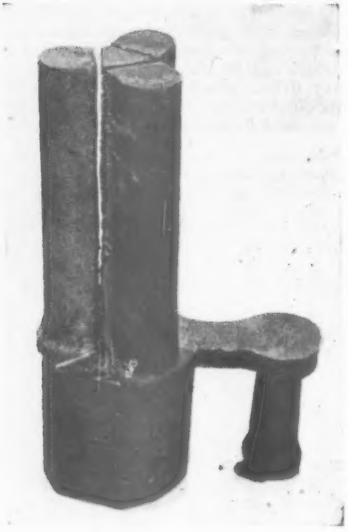


FIG. 1.—CLOVER-LEAF TEST-BAR SLIT BY ACETYLENE CUTTING.

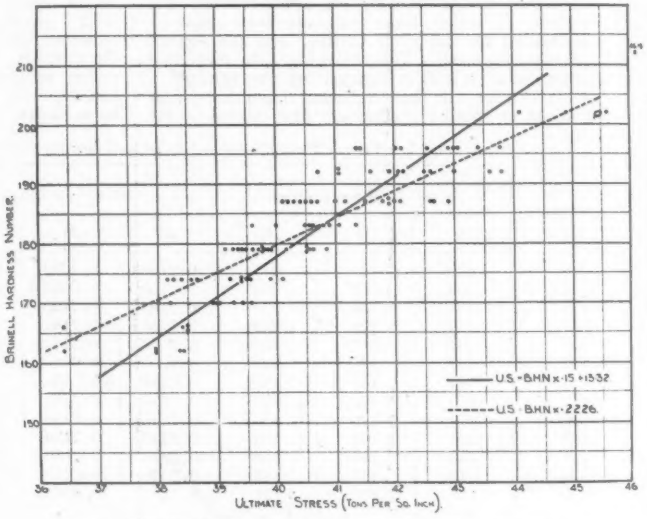


FIG. 2.—CORRELATION OF BRINELL HARDNESS NUMBER AND ULTIMATE STRESS.

data for a given steel in a given condition. The tables in general use for conversion of B.H.N. to U.S. are designed to deal as adequately as possible with all types of steel, and compromise on the factor employed. This is not always done consistently, as may be seen in Table I, which compares the factors used and the equivalent ultimate stresses from three published tables. The Author has used table "C" in this work. The greatest divergence arises in the range 143 to 207, in which range most of the work under consideration falls.

The experimental data from 100 consecutive heats are plotted in Fig. 2 to save large and cumbersome tables. Each result is represented by a dot at the

This spread of results is conveniently and quantitatively expressed as a $\pm$ variation from the average conversion factor. This is illustrated in Table III. which deals with the results from B.H.N. 187, and would be expressed 0.221 ± 0.008. Greaves and Jones[2] found under carefully controlled research conditions a variation amounting to $\pm$ 0.003; careful testing under workshop conditions on wrought steel gave results with a maximum variation of $\pm$ 0.011. To cover the most extreme results in the present case, limits of $\pm$ 0.012 are necessary. This indicates a possible error in estimating ultimate stress from the B.H.N. using the average factor of 0.2226, which is illustrated in Table IV, where results are worked out

for a B.H.N. of 183 using average, maximum and minimum factors. It will be seen from these figures that the variation amounts to ± 2.2 tons per sq. in.

This variation is shown by a closer examination of the figures to be due to a progressive decrease in the conversion factor as the hardness increases. The change of factor found in the published conversion table is, therefore, borne out by these results, although

TABLE II.—*Comparison of Factors Found Experimentally with those of Published Table "C."*

	Published table.	Experimental data.
Average	0.2218	0.2226
Maximum	0.2300	0.2346
Minimum	0.2170	0.2106

the change does not necessarily coincide very well. The average factor at each hardness number is shown in Fig. 3, the downward trend being very marked. The extreme factors at each point are also plotted and show a variation of ± 0.008 if one or two very extreme results are ignored. It seems reasonable to take this as the margin necessary to cover the errors inherent in the methods employed. This margin of error amounts to ± 1.5 tons per sq. in. It is thus seen that the estimation of ultimate stress by using the average factor for all results allows a possible overall error amounting to ± 2.2 tons per sq. in. Referring again to Fig. 2, the broken line corresponds to

$$U.S. = B.H.N. \times 0.2226,$$

and it does not truly follow the trend of the plotted results. This is due to the variation in factor referred to above.

TABLE III.—*Experimental Results at* 187 *B.H.N.*

	Minimum.	Average.	Maximum.
U.S. found .. =	40.1	41.4	42.9
$\frac{U.S.}{B.H.N.}$ .. .. =	0.215	0.221	0.229
Departure from average .. .. =	−0.006	+0.008	

Factor — 0.221 ± 0.008.

A full line is also shown on Fig. 2, which has been drawn to follow as nearly as possible the average ultimate stress at each hardness number. The formula for this line is found to be

U.S. = (B.H.N. × 0.15 + 13.32) tons per sq. in.

This gives results within ± 1.5 tons per sq. in. for 95 per cent. of the results. This is within the limits given above as due to naturally occurring errors.

The Yield Ratio of the Test-pieces

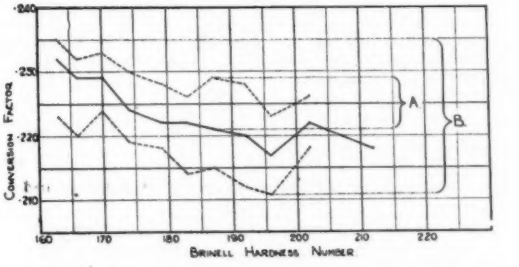
A method of investigation which originally suggested itself was to establish a relation between B.H.N. and ultimate stress and derive the yield point from the estimated ultimate stress by multiplication with the average yield ratio. The yield ratios for the 100 heats under consideration are shown plotted as a frequency curve in Fig. 4. The shape of the curve indicates a fairly normal distribution of this property. A more detailed investigation of the data showed a tendency for a lower yield ratio with a higher ulti-

TABLE IV.—*Showing Possibility of Error in Calculating U.S. from B.H.N.*

	Conversion factor.	B.H.N.	Calculated U.S.
			Tons per sq. in.
Maximum	0.2226+0.012=0.2346	183	42.9
Average ..	0.2226	183	40.7
Minimum ..	0.2226−0.012=0.2106	183	38.5

mate stress, but this was neither very marked nor very consistent.

The grand average for all results is 0.6688. The normal variation can be taken as ± 0.025, as this covers 97 per cent. of the results. Estimating yield stress from an ultimate stress of 40 tons per sq. in. gives the results shown in Table IV. Therefore, with extreme normal variation of yield ratio, yield stress varies ± 1 ton per sq. in. for the same ultimate stress.



A = NORMAL MAX. VARIATION AT ANY ONE POINT = ·008, ± 008 = APPR. ± 1·5 TONS D°

B = MAX. VARIATION OVER FULL RANGE = ± 012 ± 012 = APPR. ± 2·2 TONS D°

FIG. 3.—VARIATION OF FACTOR FOR ULTIMATE STRESS WITH B.H.N.

The B.H.N. and Yield Stress of the Test-pieces

The results given by the indirect approach *via* the U.S. and the yield ratio using average factors is shown in Table VI. By assuming all variations to work adversely a difference of ± 2 tons per sq. in. in yield stress for the same B.H.N. is revealed. Such a range of error is not realised in practice, as may be seen in Fig. 5, in which yield stress is plotted against B.H.N. in the same way as was done for ultimate stress.

Yield Stress in Certain Cast Steels

The average factor for all these results is found to be 0.1487, but, as before, the application of this factor in the normal formula, *i.e.*,

$$Y.S. = B.H.N. \times 0.1487$$

will leave a margin of error when applied over the range under consideration. This error amounts to ± 2 tons per sq. in. on the results under discussion. In Fig. 5 two lines are drawn—one corresponds to the factor of 0.1487 and the other is drawn as before

TABLE V.—*Effect of Variation in Yield-Ratio.*

	Yield ratio.	Ultimate stress.	Calculated yield point.
			Tons p.s.i.
Minimum ..	0.6688—0.025=0.6438	40 tons p.s.i.	25.75
Average ..	0.6688		26.75
Maximum	0.6688+0.025=0.6938		27.75

standard position adopted would, therefore, give representative results for the casting as a whole.

The castings in question were stacked on the trolley

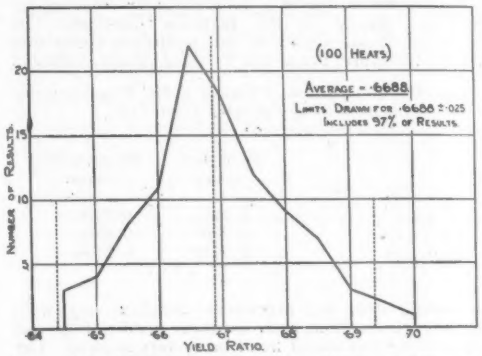


FIG. 4.—FREQUENCY CURVE: YIELD RATIO IN NORMALISED CARBON-MANGANESE STEEL.

TABLE VI.—*Brinell Hardness Number and Yield Stress of the Test-Pieces.*

$$\text{B.H.N.} \times \frac{1}{183}$$

- Max. conversion factor (0.2346) = 42.9 tons per sq. in. U.S. × max. yield ratio (0.6938) = 29.75 tons per sq. in.
- Av. conversion factor (0.2226) = 40.7 tons per sq. in. U.S. × av. yield ratio (0.6688) = 27.22 tons per sq. in.
- Min. conversion factor (0.2106) = 38.5 tons per sq. in. U.S. × min. yield ratio (0.6438) = 25.39 tons per sq. in.

to coincide as nearly as possible with the average yield at each hardness number. The formula to the latter line is found to be

$$Y.S. = B.H.N. \times 0.08 + 12.56.$$

Using this formula, 92 per cent. of the results are within ± 1 ton per sq. in.

The Agreement in B.H.N. between the Test-pieces and the Castings

As a preliminary to deciding upon a standard position for testing the castings, a number of castings were Brinelled at various points; in each case, all readings on the same casting agreed within 0.10 mm. The in a standardised very open formation. This allowed the maximum circulation both of hot gases in the furnace and cold air when cooling on the bogie. Castings on the outer corners, however, cooled appreciably more quickly than those in the centre of the load. Duplicate test-bars heat-treated in different positions in the furnace had not shown any appreciable variation in properties. In order to confirm that the castings were equally consistent, several pairs of castings were taken, one of each being placed in the centre of the load and the other on the corner. The test-bars corresponding with these arms were heat-treated in the normal position on the load. The results are given in Table VII. The observed difference in rate of cool-

TABLE VII.—*Influence of Position of Casting in Load in Mechanical Properties.*

Heat number	Per cent. C	Per cent. Mn.	Yield point. Tons per sq. in.	Ultimate stress. Tons per sq. in.	Yield ratio.	Per cent. Elongation.	B.H.N. of test-bar.	Casting B.H.N. corner of load.	Casting B.H.N. centre of load.
C.11690	0.22	1.50	26.00	38.25	0.680	20	170	170	174
C.11693	0.24	1.51	26.85	39.55	0.680	25	174	174	170
C.11696	0.25	1.52	27.80	40.60	0.685	24	179	183	179
C.11697	0.22	1.51	25.90	38.50	0.675	26	166	174	170
C.11701	0.23	1.52	27.30	41.05	0.665	21	183	179	179

ing does not appear to be sufficient to have any appreciable influence on the physical properties. (This is one of the attractive features of this type of steel.)

Comparison of the B.H.N's of the castings and test-bars for 53 heats shows that, in general, the castings gave a slightly lower hardness than the test-bars. The average difference for all results was 5 points Brinell. The extreme differences between castings and test-bars were 5 points higher and 13 points lower. Comparison of B.H.N's for castings from the same heat shows an average difference of 5 points Brinell, the maximum difference ranging from 0 to 13 points. Test-bars and castings from the same heat can, therefore, confidently be expected to give results falling well within ± 13 points Brinell, *i.e.*, a maximum range of 26 points.

(26 points B.H.N. = 0.30 mm. dia. = approx. 5 tons U.S. or 3.5 tons Y.P.)

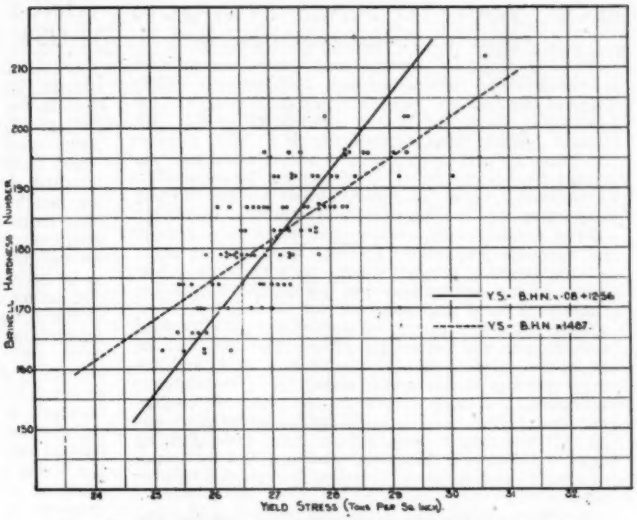


FIG. 5.—CORRELATION OF BRINELL HARDNESS NUMBER AND YIELD STRESS.

Conclusions

(1) The yield point and ultimate stress of carbon-manganese steel, heat-treated and tested as described above, can be estimated by the formulæ:—

$$\text{Y.P.} = \text{B.H.N.} \times 0.08 + 12.56$$
$$\text{U.S.} = \text{B.H.N.} \times 0.15 + 13.32$$

with an accuracy of ± 1 ton per sq. in. for the former and ± 1.5 tons per sq. in. for the latter.

(2) In order to guarantee a minimum yield point of 26 tons per sq. in., the minimum B.H.N. must be

$$(26 + 1) = x \times 0.08 + 12.56 = 180$$

This corresponds to a minimum ultimate stress of 40.3 ± 1.5 tons per sq. in.

(3) In the same way, if it be necessary to establish a maximum ultimate stress, allowance should be made for the normal variation of ± 1.5 tons per sq. in.

(4) It should be emphasised that these results will apply strictly only to the type of steel under consideration in the condition described.

For all other types of steel and conditions of heat-treatment, the fullest information as to physical properties can only be derived from the B.H.N. by the analysis of accumulated data.

The author wishes to thank the directors of Lake & Elliot, Limited, for permission to publish the information in this Paper.

REFERENCES

[1] "Design of Test Pieces for Carbon Steel Castings." C. H. Kain and E. W. Dowson. Proc. I.B.F. Vol. XXXIII, 1939-40, p. 61.

[2] Greaves and Jones. (J.I.S.I. 1926).

MALLEABLE-IRON CASTINGS

A development that will be of widespread interest to users of malleable-iron castings was announced at the meeting of Committee A-7 of the American Society for Testing Materials, involving proposed specifications for pearlitic malleable-iron castings. This proposed standard which will be offered for approval as tentative in 1944, provides for physical properties which will be readily obtainable under current manufacturing conditions, with a special class "X" not covered in the so-called regular class. Properties of this particular grade would be subject to agreement by the manufacturer and purchaser.

The committee discussed the application of its various standard requirements, and concluded that they were being widely used. There had been some question in connection with grade 35018 which calls for a minimum tensile strength of 15.5 tons per sq. in. a 23.6 tons per sq. in. yield point, with an 18 per cent. minimum elongation in 2 in., but discussion indicated that this grade was being regularly produced by a number of foundries.

The repair welding of malleable iron is a subject of interest because it is permitted by some agencies, and to get a clearer picture of what is involved, a study committee has been established. In discussion of the work of Committee A-7, it was concluded that there had been close co-operation between committee members and various Government agencies in agreeing on the various standards.

FROM WAR TO PEACE PRODUCTS

U.S. PLANS TO MAKE TRANSITION EASY

The landings in Europe and increased military action in other theatres of war call for two widely different yet closely related types of action on the production front during the immediate future, Mr. Donald Nelson, chairman of the U.S. War Production Board, said in a recent announcement. He defined these steps as: (1) The greatest possible effort by industry, labour and government to get military production up to schedule and keep it there; (2) without expansion of civilian production now, prompt and adequate preparation for such expansion in order that the whole economy may get on with the war job, secure in the knowledge that reconversion is being properly planned and prepared for.

There could be little in the way of expanded civilian production in the immediate future, said Mr. Nelson, but in the interest of war production itself, and for the protection of the entire economy, it nevertheless was essential to prepare now for the return to civilian production. Just as industrial preparations for war had to be started long before large-scale fighting began, so also the industrial preparations for peace must be begun in plenty of time before the fighting ended.

The War Production Board has been working out methods for dealing with cuts in production programmes in detail as they arise. Adjustments are already being made to permit the resumption of civilian production wherever industry and W.P.B. working together can satisfy themselves that no interference with the war effort will result. The War Production Board is lifting certain restrictions, no longer regarded as essential to protect war production. When military operations are far enough advanced, big reductions will be made in the overall war production programme. If the men and women affected are to find other work without long delay, and if plants are not to stand idle unnecessarily, industry must be ready at that time to move at once into sharply increased production of civilian goods. This can be done only if manufacturers have large backlogs of orders for civilian products which they can proceed to make as soon as man-power is available.

Manufacture of Test Products

Mr. Nelson enumerated three steps that he is taking at once to help industry plan and prepare for the reconversion period:

1.—An order is now being prepared authorising any manufacturer to acquire enough material and components to make and test a single working model of any product planned for post-war production. Under this order, any manufacturer is entitled to apply to W.P.B. regional or district offices for the necessary materials and components, which will be supplied either out of existing surpluses or through special allocations.

2.—Mr. Nelson has given instructions to revoke

(*Continued at foot of next column.*)

TUNGSTEN CARBIDE RINGS FOR USE IN CORE BOX PRACTICE

An Ohio foundry illustrates how savings can be effected by substituting a small amount of tungsten carbide for other materials exposed to wear by rubbing or abrasion. This foundry used aluminium core boxes made in halves and held together by clamps. After a box is filled with core sand and the sand rammed down into the box, the box is rubbed over the bench top to smooth off the bottom. This rubbing wore away the bottom of the boxes unevenly, which put a strain on the dowel pins used to line up the two halves of the core box. In time the box had to be scrapped or overhauled—the life of the average aluminium core box being about 1,500 cores.

The foundry obtained some fishing-rod guide rings made from cemented carbide from the Carboloy Company, Inc. In peacetime these rings were used to withstand the wearing action of fishing wire or sharp or hard fishing line. The rings were attached to the bottoms of the core boxes, so the hard abrasion-resisting rings take the brunt when the boxes are rubbed over the bench top. The result has been a big saving in time previously lost whilst the boxes were repaired or new ones made for this use of small amounts of cemented carbide at the critical points now enable the boxes to produce 9,000 or more cores before overhauling becomes necessary.—"Steel."

According to an official of the American War Production Board Steel Division, excess electric furnace capacity built and being built ranges from 110,000 to 140,000 short tons a month. Monthly capacity in operation and under construction was said to be approximately 1,300,000 tons. While output is only slightly more than 950,000 tons a month, some of the capacity is being used to make high quality carbon steel.

(*Continued from previous column.*)

the W.P.B. orders limiting the use of magnesium and aluminium so that manufacturers will be able to obtain these metals and fabricate them whenever and wherever man-power is available. With the exceptions of castings, foil, and forgings, stocks of aluminium and facilities for producing it are now more than sufficient for war needs. Existing restrictions on the manufacture of finished products from aluminium and magnesium will be lifted, by vesting in the W.P.B. regional offices authority to permit manufacture of items from these metals, as the man-power situation permits.

3.—Beginning July 1, manufacturers will be allowed to purchase machinery, tools and dies for civilian production, whenever possible out of existing surpluses listed with W.P.B. and the Defence Plants Corporation, but, if necessary, through the placing of orders validated by W.P.B. for production at times and under conditions that will prevent interference with war production.

MECHANICAL HANDLING IN FOUNDRIES

The major stages in the handling of materials for the production of castings

REPORT BY THE MECHANICAL DEVELOPMENT SUB-COMMITTEE OF THE TECHNICAL COMMITTEE

(*Continued from page* 213.)

V.—MOULDS

The handling of moulding boxes in foundries presents very real problems, and should be given the most serious consideration if the foundry is to produce the output of castings of which it should be capable.

Very few foundries in which moulds are hand made use boxes which can be lifted by hand, and undoubtedly the best method is the overhead travelling crane traversing the full width of the bay. Jib cranes carried off the building columns are, however, worthy of consideration to enable the moulder to obtain quick lifts without waiting until the overhead crane is free.

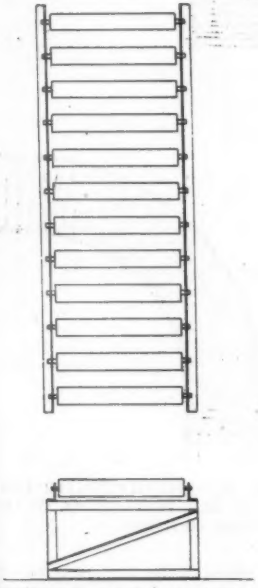


FIG. 7.—GRAVITY ROLLER TRACK.

In foundries employing moulding machines and mechanised sand handling systems the following types of conveyors are available for moulding box handling:—(1) Roller track; (2) overhead chain conveyor; (3) plate type floor conveyor; (4) slat conveyor; and (5) walking beam conveyor. Each of these conveyors may be used separately or in combination to achieve the desired object of handling the boxes at and making them available in the correct sequence for each station.

Roller Track

Roller track consists of a series of steel tube rollers supported on spindles by means of ball bearings, the ends of the spindles being carried in steel angles or channels (Fig. 7). It is important that the top edges of the rollers be in a straight line to ensure that each roller takes its share of the load and to prevent any bumping of the moulds. The rollers are manufactured from solid drawn tubing, and are usually approximately 2¼ in. diameter, although other sizes are used depending upon the pitch required to convey the boxes satisfactorily and upon the load-carrying capacity of the bearings. Moulding boxes or bottom boards, in common with any other articles for which the conveyor may be employed, should always be supported by at least three rollers at all times.

The track may be installed horizontally or at an incline, but a change from the horizontal to an incline position should be avoided since the boxes will bump on the roller at the point where this change occurs, and the bearings in this roller will not give effective service. Roller track may be manually operated or power driven, and in manually operated installations some assistance in conveying boxes may be obtained. A fall of 5 per cent. in the track will enable the boxes to run freely the full length of the track. Roller track may be power operated by fitting a driving chain engaging a sprocket wheel attached to each roller (Fig. 8.) Alternatively, the track may be constructed of twin

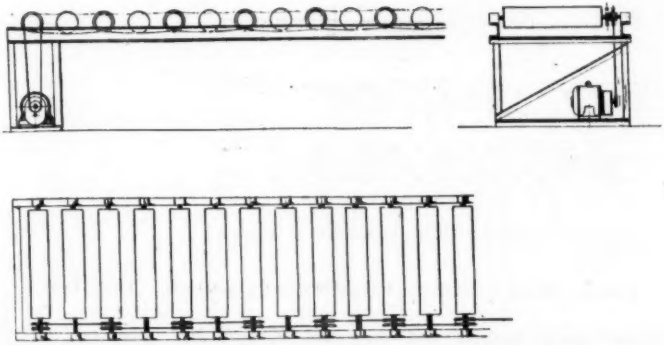


FIG. 8.—POWER-DRIVEN ROLLER CONVEYOR. LIVE ROLLER TYPE.

Mechanical Handling in Foundries

rollers and a dog chain between the two may push the boxes along, as shown in Fig. 9.

Bends may be constructed by one of two methods, illustrated in Figs. 10 and 11. Either the rollers are tapered when the radius of the bend will be dependent upon the amount of taper, or parallel twin rollers may be employed to give any desired radius to suit the load carried. The installation of roller track is quickly accomplished, the lay-out is very flexible, and maintenance is negligible, provided it is not ill used.

Overhead Chain Conveyors

There are two types of overhead chain conveyor, both of which consist of an endless chain supported on trolleys running on the bottom flange of a rolled steel joist. In one type the plates are separate (Fig. 12), and each is attached to a single, equally spaced hanger, which allows foundry personnel to walk through the conveyor. In the other type (Fig. 13) a platform is supported between brackets carried off the base of the

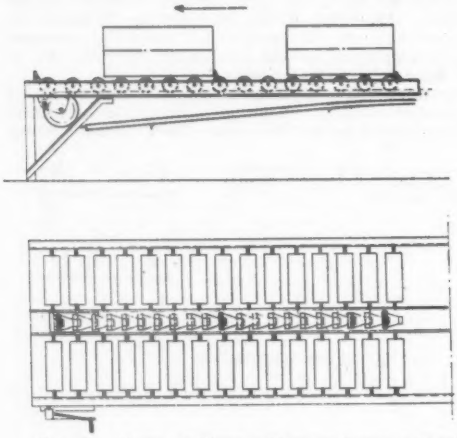


FIG. 9.—HAND OR POWER-DRIVEN ROLLER CONVEYOR. DOG TYPE.

equally spaced hangers, and movement through the conveyor, though restricted, is still safely possible.

The advantage of the latter type is that the platform is steadier, though the conveyor may only change direction in the horizontal plane. The former type of conveyor, however, may change direction in both the horizontal and the vertical planes, which is an important factor to be borne in mind when moulding, pouring, and other positions have been pre-determined and cannot conveniently be connected by other means.

Normal loads for each trolley are between 5 and 10 cwt., but the length of the conveyor is for all practical purposes limitless, although more than one driving unit may be necessary. This feature is conveniently arranged by incorporating fluid drives.

Plate Type Floor Conveyors

The plate type floor conveyor occupies large floor space, and freedom of movement over the conveyor is restricted when the conveyor is loaded, although easier

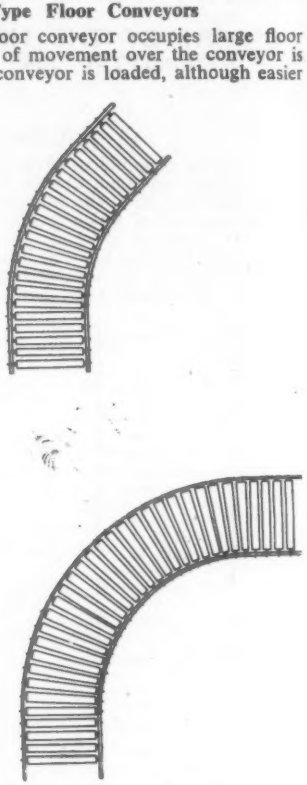


FIG. 10.—GRAVITY ROLLER TRACK. 45 DEG. BEND (TOP), 90 DEG. BEND (BOTTOM).

when the conveyor is empty. The conveyor may not, however, be crossed by barrows or trucks as is possible with the overhead chain conveyor if of the unconnected type. Inclination or declination of the track is impossible.

This type of conveyor consists of a series of plates supported in one of four ways. The plates are attached to an endless chain which is driven by chain wheel or by caterpillar chain having dogs attached. The latter are preferable for heavy loads or long lengths of track. The plate conveyor is generally of sturdier construction than the overhead chain type, and will consequently withstand a greater degree of rough usage, but on the

other hand care has to be taken in the relative positioning of the various stations to be served in view of its directional limitations.

The maximum load per plate is approximately 2 tons and the load per unit drive about 60 tons. Large moulds may be carried, and since there is no overhead gear, loading and unloading is freer. Capital expenditure and maintenance costs are higher for the same duty as compared with overhead chain conveyors. The four methods of supporting the plates classify floor plate conveyors into four types, as follow:—

Dog Type Conveyor.—With the dog type conveyor (Fig. 14) the plates, which are loose and may be used as the bottom board of the mould, are supported on rails and the drag chain operates in a vertical plane

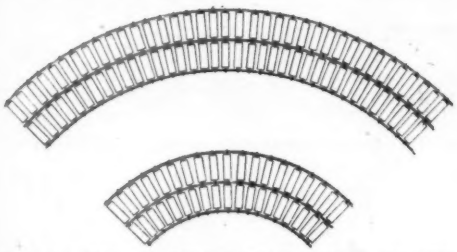


FIG. 11.—GRAVITY ROLLER TRACK. TWIN ROLLERS, 90 DEG. BENDS.

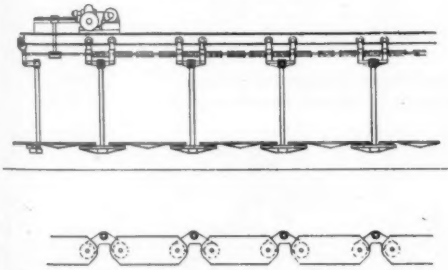


FIG. 13.—OVERHEAD CHAIN CONVEYOR. CONNECTED PENDULUM TYPE.

and pulls the plates along against friction between the plate and the rails.

This type of conveyor cannot change direction in the horizontal plane which necessitates the moulding, coring up, pouring and knock-out stations being in a straight line relationship, unless more than one conveyor is installed, in which case transfer from one to another is necessary, say, by roller track or crane.

Trolley Plate Conveyor.—The plates with this type (Fig. 15) are usually on four castor wheels running on flat topped tracks and the drag chain runs in a horizontal plane, thus permitting the conveyor to make any changes of direction in this plane. The chain runs round the chain wheels at each change of direction when driven by chain wheel, or guided round curves when driven by dogs attached to caterpillar chain. Capital expenditure is higher for this type than for the dog type of conveyor, and more attention to maintenance is required. Heavier loads may be carried for the same power input.

Fixed Roller Conveyor.—With this type of conveyor (Fig. 16), the plates are supported on fixed rollers and driven in a similar manner to that adopted for trolley plate conveyors. Occasionally, the rollers are dispensed with and the plates are skilled on rails, but this arrangement is not recommended. The directional advantages and limitations are also similar to the trolley plate conveyor.

Train-type Conveyor.—The train-type conveyor (Fig. 17) operates on a single rail and the sides of the plates are supported on rails. Stop, start and drive can be automatically set, and periods at moulding, pouring and knock-out stations thus regulated. This

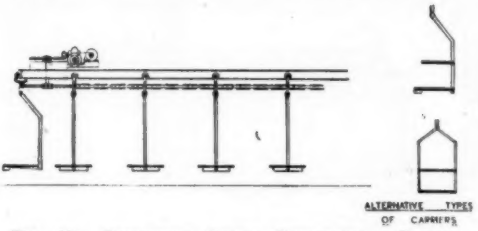


FIG. 12.—OVERHEAD CHAIN CONVEYOR. SINGLE PENDULUM TYPE.

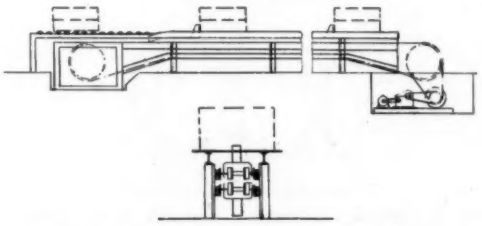


FIG. 14.—PLATE CONVEYOR. DOG TYPE.

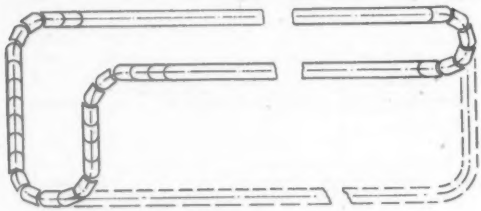
type of conveyor, while occupying more floor space than the overhead chain conveyor, has a directional versatility approximating to it and could possibly operate under limited conditions at different horizontal levels, for example, to accommodate an elevated knock-out station. The unique feature is that the traction is provided by a travelling power unit. It is, therefore, possible to have more than one train on the track at one time.

Slat Conveyors

Slat conveyors (Fig. 18) usually consist of two endless chains across which slats are mounted, the length

Mechanical Handling in Foundries

of the slats being selected to make the conveyor of the correct width to suit requirements. The slats may be placed close together to present an almost unbroken surface or spaced apart as requirements demand. This type of conveyor can operate in only one direction in the horizontal plane and is unsuitable for casting track, due to the danger of metal penetrating the gaps between slats which would result in jamming the mechanism. It can, however, be used for transporting to the knock-out station moulds which have been cast, and is capable of conveying and elevating heavy loads to such positions as elevated knock-outs. Slat conveyors are chiefly used for returning boxes from the knock-out station to the moulding machines and as elevators between sections of roller track.



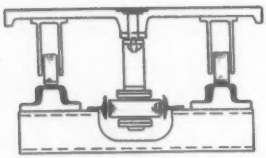


FIG. 15.—PLATE CONVEYOR. TROLLEY PLATE TYPE.

Walking Beam Conveyor

A modified form of the walking beam conveyor (mainly used for handling work through heat-treatment furnaces) has recently been applied in America, and consists of two horizontal sections of gravity roller conveyor between which the walking beam is located. The beam is of structural steel, mounted on flanged wheels which roll on rails, and one end of the beam is connected to a double-acting air cylinder which is controlled by a push-button-operated valve, giving the beam a reciprocating motion. Upon the button being pressed, the piston travels one stroke and, upon depressing the button, the piston returns, the speed being variable by means of speed check valves on both the forward and return strokes.

Spaced on the reciprocating beams are pivoted pusher dogs which engage the ribs or flanges of the moulding box or the bottom board, and, due to their shape, depress on the return stroke.

The feature of this type of conveyor is the heavy loads which may be transported and the controlled variable rate of travel.

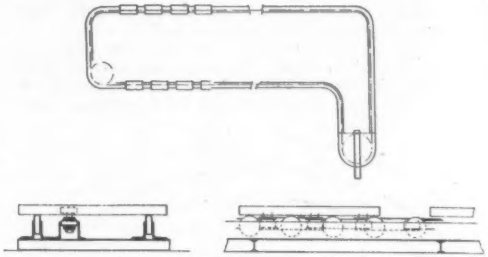


FIG. 16.—PLATE CONVEYOR. FIXED ROLLER TYPE.

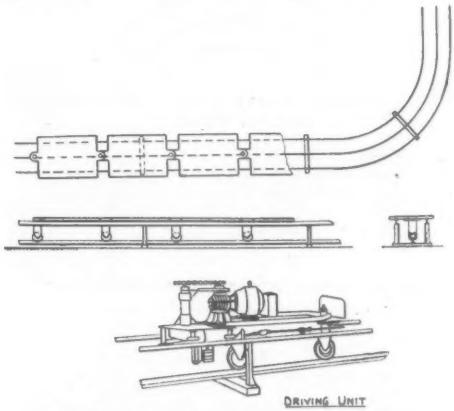


FIG. 17.—PLATE CONVEYOR. TRAIN TYPE.

VI.—CORE SAND AND CORES

Core sand may be delivered and discharged into storage bins in the same manner as moulding sand previously described. It is necessary to dry core sand before use in order to maintain a uniform moisture content to enable standardisation of mixing to be effected. This may be accomplished by a coal, coke or gas-fired stationary dryer, but if the sand contains a clay content in excess of 2 per cent., it will not easily flow, and for this type of sand and, where quantities in excess of ½ ton per hr. are required, it is more satisfactory to employ a rotary sand dryer, which may be fired by coal, coke, gas or oil. The feed to rotary-type dryers should be uniform, and this condition may be effected by a drag link conveyor (Fig. 19)

passing through the storage hopper and delivering into an elevator which in turn feeds the dryer. Before discharging from the dryer the sand passes through a screen built into the dryer to eject waste materials which may be in the sand.

After drying the sand is conveyed to storage, preferably over the mixers, by one of four methods, the first three of which have already been described under the heading "Moulding Sand." The methods are:—(1) Bucket elevator; (2) troughed belt conveyor; (3) tilting bucket conveyor; and (4) pneumatically.

The bucket elevator method is very suitable, since the feed is uniform, while the troughed belt conveyor will deliver the sand to storage some distance from the dryer, rising at an angle up to 18 deg. to the horizontal. If a number of dryers and storage hoppers are necessary, the tilting bucket conveyor will collect sand from any dryer and deliver to any one or number of hoppers.

The pneumatic method of transferring core sand from the dryer to storage also acts as a cooler and the sand may be conveyed long distances and to any position with ease (Fig. 20). This method consists of a fan, cyclone to receive the sand, and the necessary

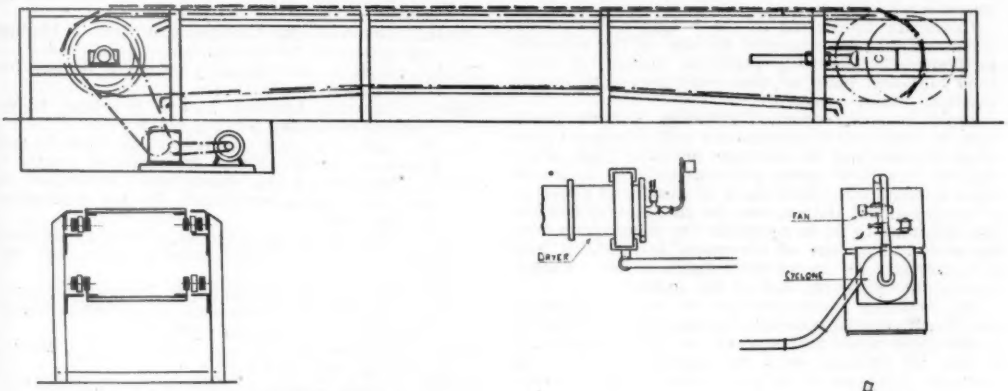


FIG. 18.—SLAT CONVEYOR.

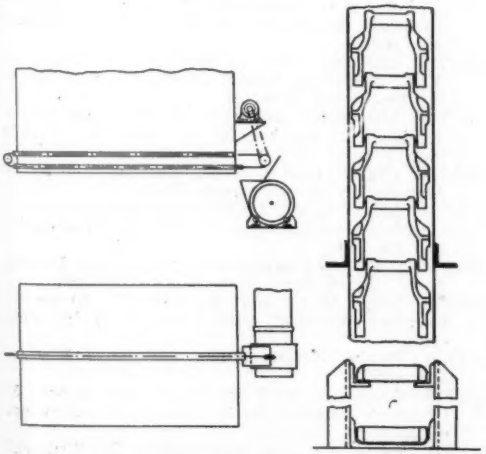


FIG. 19.—DRAG LINK CONVEYOR FEEDING ROTARY DRYER.

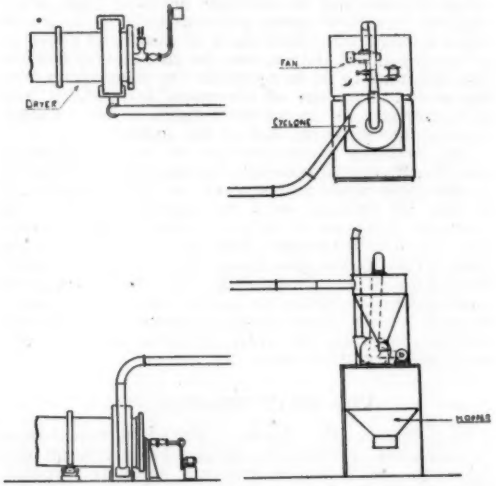


FIG. 20.—PNEUMATIC DELIVERY OF DRIED CORE SAND.

piping to the dryer. The cyclone is situated between the dryer and the fan, thus the draught is induced and only the fine sill enters the fan.

Dry sand may be fed to the mixer through a measuring device with interlocked valves at the feed and discharge ends of the regulator, which takes advantage of the flowability of dry sand, or the sand may be fed through gates into containers on rails over the mixers, which in turn discharge the sand into the mixers through gates.

Mixed sand tends to dry out and should therefore

(*Continued overleaf, column* 1.)

MECHANICAL HANDLING IN FOUNDRIES

(*Continued from previous page.*)

be delivered to the coremakers in bulk in closed hoppers with hinged or sliding doors. Elevators and conveyors are not, therefore, suitable for this duty, but if a mechanical method is required, the overhead chain conveyor with tilting buckets is satisfactory. Barrows or trucks perform the duty admirably, and if the building permits, the mixers and walkway may be on an overhead platform, so that the sand may be discharged into vertical shutes which deliver into mixed sand hoppers.

Cores are transferred to the baking ovens on flat trays and may be conveyed by any of the following methods:—(1) Elevating platform trucks; (2) roller track; (3) steel mesh or steel band conveyor; and (4) overhead chain conveyor.

Hand or power operated elevating platform trucks may be employed in conjunction with stillages, or the trays of cores may be conveyed on roller track which requires less floor space, although freedom of movement is restricted. Steel mesh or steel band conveyor is uni-directional and requires the core-making benches and machines to be in a straight line relationship with the ovens. Freedom of movement is restricted, and it is necessary for an operator always to be in attendance at the discharge end of the conveyor.

An overhead chain conveyor is very satisfactory, and the relation of core-making benches and machines to the ovens is not so restricted. A further advantage is that an operator need not necessarily remain in constant attendance at the ovens, since a tray of cores may be allowed to pass round the conveyor a second time. This feature also allows some selection of trays for baking, if this is required. Baked cores may be conveyed to the coring up stations by any or a combination of the above methods through the dressing stations, but since the cores are now firm it is unnecessary to employ trays.

VII.—HEAT-TREATMENT

Most types of the conveyors already discussed may be employed satisfactorily in the heat-treatment department. As, however, they are normally installed integral with the furnace equipment, they are not discussed here for reasons already set out in the introduction to this Report.

(*To be continued.*)

Capt. W. P. McElroy, who died recently, was the fleet captain of the Pittsburg Steamship Company. When master of the "D. G. Kerr," he unloaded 12,886 tons of ore at Two Harbours in 16¼ minutes.

The "Nickel Bulletin" for June contains a large number of abstracts covering a wide range of subjects; many of these are of distinct interest to the foundry industry. The "Bulletin" is available to our readers on application to the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

561,011 BOWDEN, J. J., and SUDA, J. S. Manufacturing of basic open-hearth furnace iron and steel.

561,174 FITZMAURICE, G. G., and HULL, F. J. K. (legal representatives of SANDBERG, C. P.), and GRAHAM, A. J. W. Method of eliminating hydrogen from steel.

561,290 EDWARDS, H. F. Method of manufacturing articles by the metal spraying process.

561,363 DOEHLER DIE CASTING COMPANY. Method and apparatus for continuously casting rod.

561,415 REID, J. B. Smoke consuming devices for steam boilers.

561,416 LYSAGHT, LIMITED, J., and PLUMLEY, E. W. Methods of cooling pickling tanks.

561,586 KERSHAW, SEN., J., KERSHAW, JUN., J., and KERSHAW, L. W. Flame treatment of metals.

561,592 STEVENS, A. H. (Vanadium Corporation of America). Alloys particularly for the production of alloy steels.

561,627 HALL & KAY, LIMITED, HALL, J. H., and HALL, S. Nuts, metal sockets, bushes and the like.

561,651 MOTRAC MOTORMAHER & TRAKTOREN AKT.-GES. Process and apparatus for the maintenance of metals of the alkaline earth series.

561,661 PROCTOR, W. F., and WEBB, G. W. Manufacture of composite metals.

561,670 PYRENE COMPANY, LIMITED. (Parker Rust-Proof Company). Production of chemical coatings on ferrous surfaces.

561,682 BRITISH THOMSON - HOUSTON COMPANY, LIMITED. Method of sealing vitreous to oxodizable metal.

561,713 GIBBONS, BROS., LIMITED, and MARLE, M. VAN. Means for feeding goods into, and removing them from, furnaces.

561,748 MAGNESIUM ELEKTRON, LIMITED, and LEECH, H. R. Flux for use in the treatment of light metal.

561,750 COLE, LIMITED, E. K., and EVANS, J. N. I. Manufacture of precipitated silica.

561,788 MONOCHROME, LIMITED, and WILSDON, S. C. Chromium surface layers on cylinder bores, shafts and the like.

561,814-15 BENNIS COMBUSTION, LIMITED, and BENNIS, A. W. Steam generator and other furnaces.

561,818 JONES, W. H., and LYONS, W. H. Automatic electrical control of metal-cutting or like machine tools.

561,821 BRIGGS MANUFACTURING COMPANY. Welding apparatus.

561,829 BEAVER, C. J., DAVEY, E. L., and GLOVER & COMPANY, LIMITED W. T. Presses for extruding metal.

561,871 HIGHFIELD, J. S., and FAIRLEY, T. Crushing or pulverising machines.

562,037 ELECTRO METALLURGICAL COMPANY. Apparatus for producing magnesium.

SOME ASPECTS OF TECHNICAL SERVICE APPLIED TO THE IRONFOUNDRY*

Liaison between producer and customer is a worthy aim

By H. JACKSON

Technical service may appear remote from the customary Papers on research and production discussed at Institute meetings, but on closer investigation can be found to be closely allied to, and an integral contribution to, the future prosperity and efficiency of the industry. At this stage, before examining the principles and possible advantages arising from technical service, it must be remembered that it is held to mean more than the actual servicing of products at present offered by so many progressive firms.

In an attempt to classify a technical service engineer, the following qualifications could well be expected:—(1) A practical and theoretical knowledge of the product represented; (2) a general knowledge of the field of engineering in which the product is used; (3) a mind open to receive suggestions of a progressive nature; and (4) a desire to place the product marketed in the forefront of the market.

The service and its effects may be sub-divided as follows:—(*a*) To promote a wiser use of the foundries' products in industry and in consequence build up a wider market; (*b*) to create a liaison between producer and consumer, and impart to the industry any benefit arising from the interchange of ideas; and (*c*) opportunities for strengthening the position of cast iron in present-day markets.

Under the first heading, the technical service engineer is expected to meet and placate customers, who, while fully aware of their own requirements, have an insufficient knowledge of the foundry to call for the ideal casting to meet requirements; or, when possessing a casting, lack the knowledge required to make the best possible use of the article supplied. Too often an article failing under service, through an unintelligent use, is responsible for the condemning of any future efforts the foundry may make to supply that particular market.

Impersonal Method of Conducting Business

Present-day commerce, with the ever-widening gap between sales department and production departments, is tending to estrange the actual producer from the customer. While it is realised that the vastness of modern concerns is making impossible the individual and intimate contacts found in small concerns, this impersonal method of conducting business may have a strangling effect on the marketing of products. Any offer made to a sales department receives the attention of the purchasing agent, who, buying for a wide field or variety of articles, cannot be expected to possess an extensive knowledge of these articles.

On the other hand, a technical service engineer, meeting a customer, immediately contacts his counterpart—the customer's technician—who is able to appreciate and, if necessary, discount any advantages claimed for the article under discussion. The constant presence of a technically-trained person amongst the article sold, with unbounded possibilities of viewing the castings under working conditions, together with the opportunities of hearing criticisms and reactions to the product, can prove most beneficial to a producer.

Any casting, when leaving the foundry, is, or should be a perfect specimen of the moulder's art, but, viewed from the eyes of a consumer, may possess unlimited disadvantages. This reservoir of possible improvement may only be drawn on by a technical engineer who is free to approach and discuss without creating any air of distrust and suspicion on the customer's part.

A Research Station

In fact, the field of industry becomes a research station maintained free of charge to the foundry industry. Not all the reports and experiences are expected to be of a flattering nature, but out of the most serious complaint investigated, some point of interest and benefit to the foundry may be found. When closely examined, it is seen that commerce is merely a compromise between supplier and consumer, and this compromise can be more readily reached when the persons striving for a solution have a technical knowledge and training rather than a commercially-minded outlook.

Previous discussions at these Institute meetings have dealt with education in the foundry and stressed the necessity for improvement if the foundry is to live; could not this provision of technical service claim to have a beneficial effect on the education of the customers, and in this way contribute a share towards the improvement of the foundry industry?

In closing, it can be claimed that this liaison between producer and customer is capable of returning a dividend to both sides, due to the mutual exchange of experiences. In fact, technical service, allied to a sound product, can prove a first-class salesman, and, while it is appreciated that the Institute discussions are not directly connected with sales, a foundry industry, however highly qualified and efficient, lacking a market for its products, would have a short existence.

* Winning Entry in a Short Paper Competition organised by the East Midlands Branch of the Institute of British Foundrymen.

Some Aspects of Technical Service

DISCUSSION

MR. A. B. BILL said, while the broad outline of this Paper is "Technical Service," it would appear that the greatest benefit to be derived is that of co-operation between customer and foundry. He suggested that a Paper dealing exclusively with this aspect of technical service would amply repay the author for his efforts. It would appear, however, that the qualifications necessary for such a position would inevitably lead their holder into the foundry rather than away from it, since post-war competition will demand the utmost efforts, both technical and practical, from all foundry executives. Mr. Jackson asked for an improvement in the general quality of castings, which raised the question as to whether the difficulties which beset the unfortunate founder were sufficiently realised. Possibly the standard of physical quality and accuracy necessary demanded a higher selling price which would enable the founder to spare more for research.

MR. JACKSON, in reply, said a technical service engineer with an intimate knowledge of the foundry should have a commercial view towards life so that he might safely mix with all parties. Surely it was possible to become a technical service engineer and still retain some knowledge of the remaining sides of commercial life. As to any improvements in the foundry, it is felt that a foundry executive would appreciate this demand for a better casting more if it came from a technical service engineer.

MR. C. POLLARD asked whether he would have technical servicing men attached to the sales department or works' executives.

MR. JACKSON thought it was possible to combine with both; in fact, it was essential. They were chiefly connected with the works' executives, but naturally worked for the well-being of the firm as a whole.

MR. J. C. HALLAMORE asked how the service engineer was going to get first-hand knowledge and experience on both sides. In the event of trouble occurring, was the service engineer to say what the foundry foreman had to do to rectify it, or had the foreman to get out of his own difficulty?

MR. JACKSON said the service engineer need only have a wide knowledge of his own subject, together with general knowledge of the industry, thus creating a compromise. The foundry industry was obviously eager to effect sales as well as to improve castings. A technical service engineer would never desire to return to the foundry and dictate any policy to the foundry. One must bear in mind this word "compromise." In fact, technical service engineers were there to assist the foundry.

MR. J. ROXBURGH said first of all there was the question of selling the casting, and then there was the question of this technical service to which Mr. Jackson had referred. Now, was it to be assumed that this technical service engineer was the technical salesman as well? Did he combine both duties? He felt that the person who required education was the buyer, because, through experience, one found that the buyer was particularly anxious to purchase the cheapest casting, in many cases without giving due attention to the quality of the castings offered. His mind was so full of prices that he could not really comprehend the qualities of any particular material, except by experience; in fact, in some cases he was not familiar with what the foundry could offer to meet the service conditions which the casting had to withstand. So, therefore, it was up to the foundry industry to ensure that the buyers and the engineers were informed from the standpoint of the foundry; in other words, the engineers and buyers should know something about what they were buying, and that information should be given to them from the foundry angle. Having given them such knowledge, surely it was possible to find a technical salesman, and unless one operated a very big concern, this sales engineer would have to be a salesman and technical man as well. There was tendency for all salesmen to be technical people. This liaison between the salesman and the customer was necessary and, with larger companies, technical service in addition should be made available.

MR. JACKSON said it was felt that a technical representative should not be concerned unduly with sales. Increased orders might follow as the result of the increased confidence and satisfaction the customer received following technical service, but this should not be the reason for the presence of technical service representatives in industry.

IRONFOUNDRY FUEL NEWS—XII

The ninth article in this series, published in THE FOUNDRY TRADE JOURNAL of June 29 last, emphasised the desirability of operating a cupola at the internal diameter which is most suitable for the melting rate which is required. This diameter being decided, it is, of course, important that the dimension should not be allowed to increase unduly, as less efficient working would then result. Members of the Regional Panels of the Ironfounding Industry Fuel Committee have found in a number of cases, when visiting ironfoundries, that insufficient care has been taken in the patching of the cupola and that the internal diameter in the region of the tuyeres and melting zone has been appreciably in excess of the believed dimension. The simplest method of ensuring that this does not occur is to provide a gauge stick for use when patching the lining.

As an illustration of what can occur, one might take the case of a 36 in. dia. cupola for, say, 250 melts a year. If the difference between the nominal diameter and the actual diameter of the patched lining is 6 in. (by no means unheard of) for an effective height of about 2 ft., the extra coke that will be required for the bed alone will amount to about 15 tons for the year. Of this, some 5 tons may be recovered, leaving a net loss of 10 tons.

The High-Quality Iron for High-Duty Castings.

Made in seven standard grades or to individual requirements, this iron has a close grain structure and fine graphitic carbon content. It replaces Hematite, and tones up high phosphorus irons.

We also make Dale Refined Malleable Iron to any required specification.

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DALE *Refined* PIG IRON

THE STANTON IRONWORKS COMPANY LIMITED

NEAR NOTTINGHAM

NEWS IN BRIEF

COURSES IN METALLURGY and foundry work are to be started at the Constantine Technical College, Middlesbrough.

THE BRIGHTSIDE FOUNDRY & ENGINEERING COMPANY, LIMITED, announce that on Monday next they are moving their London offices to larger premises at 57, Tufton Street, S.W.1.

REMARKING, in a statement to shareholders, that supplies of raw material are adequate to cover existing output, Mr. L. F. Wright, the chairman and managing director of Gjers, Mills & Company, Limited, pays a tribute in this connection " to the efficient manner in which the Iron and Steel Control operates, under conditions which, to say the least, are by no means easy."

AFRICAN MALLEABLE FOUNDRIES, LIMITED, a new enterprise of the Anglo-American Corporation of South Africa, Limited, has been unable to reach the production stage owing to the delay experienced in obtaining essentiality certificates for the machine-tool equipment for the patternshop and the machine shop. All plant and equipment has now been ordered and the main furnace plant has arrived from America. It is anticipated that the foundry will commence production shortly.

THE NEED for a greater appreciation of good design as an important factor in the production of articles for export was emphasised by Mr. Harcourt Johnstone, secretary of the Department of Overseas Trade, at a luncheon of the Design and Industries Association in London. No one could estimate what price levels would operate after the end of the war, nor the terms of trade which this country would face, said Mr. Johnstone, but it was probably fair to say that we should need to aim at a target 50 per cent. higher than our pre-war export trade in order to maintain an equivalent standard of living.

REVIEWING Eire's industrial problems in the Chamber of Deputies, Mr. Sean Lemass, Minister for Industry and Commerce, said that this year they had been fortunate in being able to make arrangements for the supply of a large quantity of steel billets. Despite all their efforts they had so far failed to obtain in Britain the special bricks necessary to complete their melting furnaces at Haulbowline. An effort was now being made to secure them in America. It would then be possible to utilise the considerable quantities of scrap in the country.

THE SCOTTISH BRASS TURNERS & FINISHERS ASSOCIATION and other unions have been invited to send delegates to a conference in London convened by the A.E.U. to discuss amalgamation. Among those to be represented are the United Pattern Makers' Association, the Electrical Trades Union, National Union of Foundry Workers, Constructional Engineering Union, Association of Shipbuilding & Engineering Draughtsmen, Scalemakers, and Amalgamated Society of Vehicle & Wagon Builders. If any scheme of merger is approved it will be submitted to the various unions for approval by a ballot vote.

PERSONAL

DR. ALEXANDER THOM has been appointed to the Professorship of Engineering Science at Oxford University from a date to be determined later.

MR. C. LACY-HULBERT has been appointed a joint managing director of the Simplex Electric Company, Limited, and of Mersey Cable Works, Limited.

LIEUT.-COLONEL A. J. PARKES. M.C., of Wolverhampton, a well-known figure in the iron and steel industry of the Midlands, has been appointed a Deputy Lieutenant for the County of Stafford.

MR. ROBERT B. MARTIN, of Barnet & Morton, Limited, iron and steel merchants, Kirkcaldy, has retired after 64 years' service with the firm. He was appointed a director of the company in 1928.

MR. F. M. MITCHELL retired on June 30 from the secretaryship of the Broken Hill Proprietary Company, Limited, and of Australian Iron & Steel, Limited, and Rylands Bros. (Aust.) Pty., Limited. MR. R. G. NEWTON succeeds to these positions.

MR. A. T. SHARDLOW has had 50 years' active connection with the firm of Arthur Shardlow & Company, Limited, of which he is chairman and managing director, and to mark the occasion the employees have presented him with an illuminated address.

MR. E. BRUCE BALL, joint managing director of Glenfield & Kennedy, Limited, has now been appointed senior managing director, following the death of his father, Mr. E. Bruce Ball, senior. MR HENRY GARDNER is appointed an additional director. SIR THOMAS KENNEDY, for many years the company's general manager in India, has been appointed a director.

DR. N. P. ALLEN has been appointed Superintendent of the Metallurgy Division of the National Physical Laboratory. Dr. Allen was for seven years assistant lecturer in the metallurgy department of Birmingham University, and since 1935 has been senior research metallurgist in the research and development department of the Mond Nickel Company, Limited, Birmingham.

Will

McCAUL-BELL, CAPT. G., of Tunbridge Wells, director of the Halesowen Steel Company, Limited ... £60,833

OBITUARY

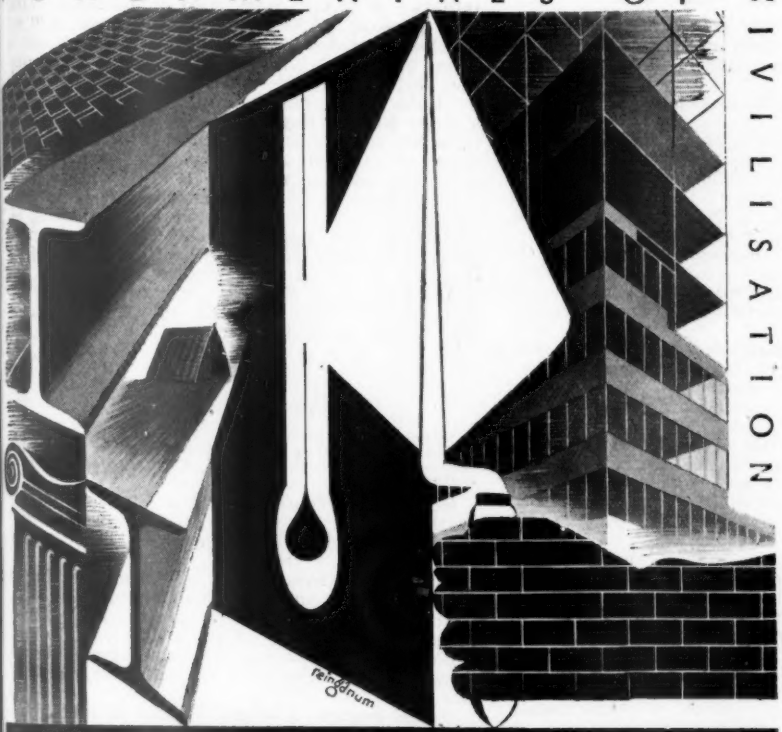
MR. ALFRED VAUGHAN, of Weybridge, a director of the Revo Electric Company, Limited, died on July 7.

MR. JAMES SWEENEY, Scottish organiser and secretary of the Iron and Steel Trades' Confederation since 1935, has died at the age of 65.

MR. H. CECIL VICKERS, who died recently at the age of 62, was chairman of the Hydraulic Coupling & Engineering Company, Limited.

AT AN EXTRAORDINARY MEETING of the Watford Electric & Manufacturing Company, Limited, it was agreed to increase the capital from £60,000 to £160,000 by the creation of 60,000 6 per cent. cumulative preference shares and 300,000 ordinary shares of 2s. each.

FUNDAMENTALS OF CIVILISATION



THE UNITED STEEL COMPANIES LTD

No. 4 SHELTER

To possess a habitation is the common instinct of every living creature. Nature displays many marvels of ingenuity and constructive skill only surpassed by man. But the spider still spins its web as it did millions of years ago. Aeons of change and development in living organisms have added nothing to the materials of construction used by the birds, beasts, fishes and insects.

The highest product of evolution is man, who acquired reasoning powers which first enabled him to abandon the clammy caves for the warmth and comparative security of a wood and wattle hut. From these dim beginnings he learnt to make bricks from clay; to hew and carve the stone for temple and cottage. Yet, though he acquired skill to fashion rich architectural gems with greater spans of roof in wood and stone, his shelter was still earthbound.

With the advent of steel his imagination began to soar till now it has become essential to his needs in erecting structures of towering height. The progressive genius of man will find even greater scope in utilising the many forms of steel in the light, airy and spacious edifices for the cities of the future.

THE UNITED STEEL COMPANIES LIMITED

STEEL, PEECH & TOZER, SHEFFIELD
SAMUEL FOX & CO. LTD., SHEFFIELD
UNITED STRIP & BAR MILLS, SHEFFIELD
APPLEBY-FRODINGHAM STEEL CO. LTD., SCUNTHORPE
WORKINGTON IRON & STEEL CO., WORKINGTON
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THE ROTHERVALE COLLIERIES, TREETON
UNITED COKE & CHEMICALS CO. LTD.
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COMPANY RESULTS

(Figures for previous year in brackets)

Mason & Barry—Dividend of 5% (nil).

Consett Iron Company—Ordinary dividend of 7½% (same).

Briton Ferry Steel—Final dividend of 7½%, making 10% (same).

Bromilow & Edwards—Net profit, £15,224 (£10,329); dividend of 10% and a bonus of 2½% (same).

Birmid Industries—Net profit for the year ended October 31, 1943, £120,354 (£118,920); dividend of 10% (same) and a bonus of 7½% (same); to reserve, £50,000; forward, £50,596 (£40,179).

Banister, Walton & Company—Net profit for the year ended March 31, after providing for income-tax and N.D.C., £23,971 (£21,056); ordinary dividend of 20% (same); to reserve, £10,000 (same); forward, £13,897 (£12,190).

John Brown & Company—Net profit for the year ended March 31, £367,619 (£365,854); preference dividends, £49,010; ordinary dividend of 10%, tax free (same); to reserve for contingencies, £100,000; forward, £226,104 (£222,885).

Mirrlees Bickerton & Day—Profit to March 31 last, after depreciation and taxation, £32,136 (£26,186); war insurance, £1,704 (£2,377); preference dividend, £1,952 (same); ordinary dividend of 8% (same), less tax at 8s. 6.56d., £21,349 (£18,640); forward, £17,609 (£10,479).

W. H. Baxter—Profit for the year to March 31, £6,318 (£14,117); taxation after crediting an amount transferred from general reserve, £6,603; dividend, less tax, on the 7% preference shares, £1,400; dividend of 5%, less tax, on the ordinary shares (10%), £1,500 (£3,000); forward, £161 (£3,347).

Morgan Crucible—Net profit to March 31 last, £207,119 (£163,168); preference dividends, £54,475 (same); ordinary dividend of 10%, £107,900 (same); to reserve, £44,283 (nil); forward, £1,520 (£1,059). A bonus of 6d. per £1 stock from realised net capital profits amounting to £118,152 is also recommended, leaving a balance in capital reserve of £64,202.

Ward & Goldstone—Net profit for the year ended March 31, after income-tax and E.P.T., £47,190 (£47,636); to employees' fund, £1,500; depreciation, £10,470; war damage insurance, £1,290; deferred repairs, £5,000; final dividend of 10% on the ordinary stock, making 20% (same); to taxation reserve, £10,000; forward, after preference dividend, £46,194 (£40,101).

Thomas Bolton & Sons—Profit for the year to March 31, after E.P.T., £288,398 (£299,043); net profit, after £70,000 (£80,000) for depreciation, £65,944 (£69,771); 5% preference dividend, less tax, £7,500 (same); interim dividend on the ordinary shares of 2½%, £6,250 (same); final dividend of 5%, plus bonus of 2½%, £18,750 (same); to general reserve, £20,000 (£30,000); war contingencies, £10,000 (£20,000); forward, £68,872 (£65,428).

Mellowes & Company—Profit for 1943, after providing for depreciation, £116,281; to reserve for taxation, £65,000 (£30,000); war contingencies, £18,000 (£10,000); to special depreciation of buildings, £7,000 (nil); pensions, £2,500 (same); net balance, £20,962 (£13,598); ordinary dividend of 20% (same) and a bonus of 7½% (2½%), making 27½% (22½%); preference dividend, £1,750; to reserve for equalisation of dividends, £5,000 (nil); forward, £2,380 (£1,918).

Guest Keen & Nettlefolds—Net profit of £965,028 (£904,000) for the year to March 31 last, after providing for taxation, and after charging debenture interest and redemption £93,302 (£94,187) and depreciation £300,000 (£275,000); war damage insurance, £13,500 (£22,000); to war contingencies account, including deferred repairs, £50,000 (same); to general reserve, £150,000 (same), in addition to £45,233 (£44,250) arising from debenture redemption and £250,000, being surplus taxation provision over the four years to March 31, 1943; ordinary dividend of 10% (same); forward, £629,554 (£527,629).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Herberts (Hardware), 183, West Street, Sheffield—£3,000. H. and E. Beecroft.

Vanguard Engineering Company—£1,000. J. W. Patterson and J. C. H. Maile.

Osborne Engineers—£1,000. C. Morey-Binnington, 9, Tranby Lane, Anlaby, E. Yorks, subscriber.

Roba Steel Products, Broomgrove Lane, Denton, Manchester—£5,000. F. Barnsley and J. W. Roberts.

Dies, Castings, Plastics, 2, St. James Street, Shelton, Stoke-on-Trent—£1,000. M. G. Halfpenny and K. W. Gee.

Welded Products (Carlisle), 29, Oxford Street, Newcastle-upon-Tyne—£1,000. P. Spiro, T. F. Short, and G. Darling.

Gayford, Edward & Company, 13, St. Peters Street, Nottingham—Engineers, tool manufacturers, etc. £500. F. G. Ellen and C. M. Glen.

Harcast, 20, Essex Street, London, W.C.—Agents for electric and other furnaces, etc. £12,000. J. Caldwell, J. C. Hart, and P. S. E. Seth-Smith.

F. Morris & Sons, Elnor Lane, Whaley Bridge, Derbys—To take over the business of the "Shallcross Iron Foundry," Whaley Bridge. £1,000. E. and W. Morris.

Cylinder Head and Block Reclamation.—The Suffolk Iron Foundry (1920), Limited, of Stowmarket, have issued an 8-page pamphlet (No. 3,239) which details the methods to be followed when repairing cracked or broken cylinder blocks and heads using the "Sifbronze" process. Each step is clearly described and well illustrated. It is available to our readers on writing to Stowmarket, Suffolk.

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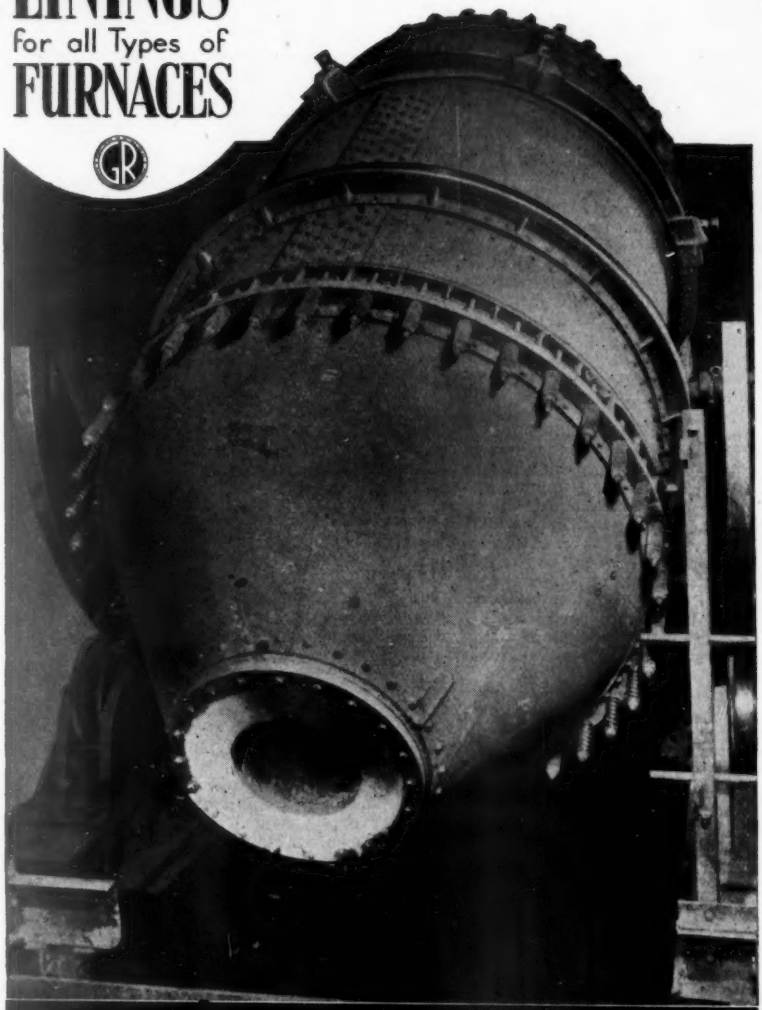

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FIRECLAY BRICKS BASIC BRICKS ACID-RESISTING MATERIALS PLASTICS INSULATION SILICA BRICKS SILLIMANITE HIGH ALUMINA CEMENTS

374

Raw Material Markets

IRON AND STEEL

There are relatively few foundries which are not working at a reduced tempo. Slackness of trade has prevailed throughout the year in the light-castings industry, and latterly many of the jobbing and engineering foundries have been less busily employed. These conditions are reflected in a lessened consumption of both high- and low-phosphorus irons, whilst the pressure for refined iron is not so keen as it was a few months ago. Hematite is severely rationed owing to the limited output. Demand for basic iron for the steelworks is unimpaired.

British steelmakers have been directed to provide increased tonnages of billets, blooms and steel bars to enable the re-rolling mills to fulfil their heavy rolling programme. Steelmakers have made a good response, but the Control is anxious to avoid any further encroachments upon stocks of imported material, and consequently works are also using considerable quantities of defective billets, crops, old rails, etc.

Recovery in the demand for heavy structural steel has neither occurred nor is expected, but makers still have substantial bookings for light and medium sizes. Plate mills still have a considerable volume of work in hand, although the extreme pressure for deliveries has subsided. Here also specifications for the lighter sizes predominate, and sheet mills have extensive orders both from the shipyards and also for military hutments, hangars, containers, etc. Railway companies and colliery companies are not allowed to place unlimited orders for maintenance material, but in all cases are keen to take up their maximum quotas, while tube manufacturers, wire mills and rivet makers still maintain a high level of activity.

In complete reversal of the past international flow of steel, Britain has agreed to ship to the United States 10,000 tons a month " to head off the impending steel shortage in America." This quantity should be well within the capabilities of the British steel industry, for although war demands for steel are at a high level still, there remains some surplus of capacity at present output levels. The transaction has been arranged by the Combined Production and Resources Board in Washington.

NON-FERROUS METALS

It is likely that there has been an all-round reduction in the scale of copper shipments to Britain. Output in Rhodesia has been appreciably curtailed, although not to the extent originally planned. The shortage of copper in America led to the modification of this scheme, and the United States' commitments to supply Russia have been transferred to the Rhodesian mines. While the recent strike must have considerably affected output, the dispute has been referred to arbitration, and the consequences are not believed to be serious.

Canadian copper output has also been curtailed by labour problems, and shipments to Britain from this source are likely to be noticeably smaller. Another factor is that Canada is sending supplies to the United States. This lower standard of imports emphasises the fact that there has been a reduction of activity in the British non-ferrous metal trade, and the copper section in particular. If allowance is made for the tonnage being put into stock, the cut in consumption is even larger than may at first be apparent.

The tin situation remains stable. Although tin is not as plentiful as are some of the other metals, industry generally is being adequately served. Imports are coming in on a comfortable scale, and there is certainly not the anxiety that surrounded the supply problem some time ago. It seems that Germany is now feeling the pinch, and drastic measures are necessary to eke out the diminishing supplies, with a greater degree of substitution than was hitherto thought possible.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"PRESSOVAC"—Metal castings. HORACE LESLIE-JAMES, 9, Aldermoor Lane, Coventry.

"GYP"—Metal couplings for flexible tubes. HIGH-PRESSURE COMPONENTS, LIMITED, London, S.W.1.

"CLANG"—Metal goods and domestic utensils. CLANG, LIMITED, Crown Yard, Cricklewood, London, N.W.2.

"FEEDEX"—Agricultural machinery and implements. HORACE FULLER, LIMITED, 72, Park Street, Horsham, Sussex.

"CLAYFLEX"—Joints for metal pipes made of metal and rubber. CLAYFLEX, LIMITED, 4, Tiddington Road, Stratford-on-Avon.

"MISTRAL"—Electric motors and generators, fans, etc. HUGH J. SCOTT & COMPANY (BELFAST), LIMITED, Ravenhill Avenue, Belfast.

"HIPERSIL"—Electrical apparatus. WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, c/o G. Raymond Shepherd, 2, Norfolk Street, Strand, London, W.C.2.

SWORDSMAN (device)—Pistons, bearings and connecting rods for internal combustion engines, pumps, etc. TOLEDO STEEL PRODUCTS COMPANY, c/o Frank B. Dehn & Company, 103, Kingsway, London, W.C.2.

Mr. J. Ferdinand Kayser, the President of the London Branch of the Institute of British Foundrymen, played the leading part in a recent broadcast designed to interest the public in the manufacture and care of razor blades. Mr. Kayser is chief metallurgist to Gillette Industries, Limited.

"Foundry Practice," the house organ of Foundry Services, Limited, Long Acre, Nechells, Birmingham, in its May-June, 1944, issue deals with aluminium gravity diecasting and sand testing. Additionally a number of opinions have been collected on three interesting questions concerning the feeding of castings.